**[0017]** As used herein, a blade tip velocity $u_{TIP}$ of a turbine stage is understood to mean, in particular, the maximum velocity of a radially outermost tip of a blade of the rotor blade array of the turbine stage in the circumferential direction at the design point; i.e., in particular, at maximum allowable rotational speed.

**[0018]** When several of the above-mentioned aspects are combined; i.e., when the limits specified there are observed in combination with one another in the design, then a very advantageous, in particular low-noise, efficient and/or compact turbofan aircraft engine is obtained.

**[0019]** In one embodiment, a bypass area ratio

$$\left(\frac{A_B}{A_C}\right)$$

of an inlet area (AB) of the secondary duct to an inlet area (AC) of the primary duct is at least 7, in particular at least 10:

$$\left(\frac{A_B}{A_C}\right) \geq 7 \tag{7}$$

or respectively,

$$\left(\frac{A_B}{A_C}\right) > 10. \tag{7a}$$

**[0020]** As used herein, an inlet area of the primary or secondary duct is understood to mean, in particular, the flow-through cross-sectional area at the inlet of the primary or secondary duct, preferably downstream, in particular immediately downstream, of the fan and/or at the same axial position.

**[0021]** In one embodiment, a maximum blade diameter $D_F$ of the fan is at least 1.2 m.

**[0022]** A turbofan aircraft engine according to the present invention may in particular be advantageously used as an engine for a passenger jet for at least 10 passengers. Accordingly, one aspect of the present invention relates to a passenger jet for at least 10 passengers, which has at least one turbofan aircraft engine as described herein and is designed or certified for a cruising altitude of at least 1200 m and/or no more than 15000 m and/or a cruising speed of at least 0.4 Ma and/or no more than 0.9 Ma.

**[0023]** Another aspect of the present invention relates to a method for designing a turbofan aircraft engine according to the present invention, which satisfies one or more of the aforedescribed conditions, in particular of the above equations (1) through (7).

**[0024]** In summary, a particularly advantageous, in particular low-noise, efficient and/or compact passenger jet or turbofan aircraft engine can be provided by selecting suitable design parameters as described above.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0025]** Further advantageous features of the present invention will be apparent from the dependent claims and the following description of preferred embodiments. To this end, the drawings show, partly in schematic form, in:

**[0026]** FIG. **1**: a turbofan aircraft engine of a passenger jet according to an embodiment of the present invention;

**[0027]** FIG. **2**: a design range according to the present invention in a diagram of a total pressure ratio and a total blade count;

**[0028]** FIG. **3**: a design range according to the present invention in a diagram of a total pressure ratio and a total stage count;

**[0029]** FIG. **4**: a design range according to the present invention in a diagram of a product of an exit area and a square of a rotational speed of the second turbine and a blade tip velocity; and

**[0030]** FIG. **5**: a design range according to the present invention in a diagram of a product of an exit area and a square of a rotational speed of the second turbine and a stage pressure ratio.

## DETAILED DESCRIPTION

**[0031]** FIG. **1** depicts a turbofan aircraft engine of a passenger jet in accordance with an embodiment of the present invention, the engine having a primary duct C containing a combustion chamber BK. The primary duct has a first turbine or high-pressure turbine HT, which is located immediately downstream (to the right in FIG. **1**) of the combustion chamber and includes a plurality of turbine stages. The high-pressure turbine is fixedly coupled to a high-pressure compressor HC of the primary duct via a hollow shaft W**1** and, hence, such that they rotate at the same speed, the high-pressure compressor being disposed immediately upstream of the combustion chamber. As used herein, a coupling providing for rotation at the same speed is understood to mean, in particular, a non-rotatable coupling having a constant gear ratio equal to one, such as is provided, for example, by a fixed connection.

**[0032]** The turbofan aircraft engine has a secondary duct B, which is arranged fluidically parallel to and concentric with the primary duct. A fan F is disposed immediately upstream of the primary and secondary ducts (to the left in FIG. **1**) to draw in air and feed it into the primary and secondary ducts. An additional compressor or low-pressure compressor is disposed between the fan and the high-pressure compressor.

**[0033]** The fan is connected through a speed reduction mechanism including a transmission G and via a low-pressure shaft W**2** to a second turbine or low-pressure turbine L of the primary duct. The low-pressure turbine includes a plurality of turbine stages and is disposed downstream of the high-pressure turbine (to the right in FIG. **1**). Hollow shaft W**1** is concentric with low-pressure shaft W**2**.

**[0034]** A bypass area ratio

$$\left(\frac{A_B}{A_C}\right)$$

of an inlet area $A_B$ of the secondary duct (indicated by a dashed line in FIG. **1**) to an inlet area $A_C$ of the primary duct (indicated by a dot-dash line in FIG. **1**) is at least 10, and a maximum blade diameter $D_F$ of the fan is at least 1.2 m.

**[0035]** In FIG. **2**, a design range according to the present invention for the turbofan aircraft engine of FIG. **1** is shown unidirectionally hatched in a diagram of a total pressure ratio $(p_1/p_2)$ and a total blade count $N_{BV}$ of the second turbine. For comparison, a design range according to previous in-house